Ozonation as an effective pretreatment for reducing antibiotic resistance selection potency in oxytetracycline production wastewater

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ABSTRACT

High concentrations of antibiotics in wastewater can promote antibiotic resistance during biological wastewater treatment. In this work, ozonation was evaluated regarding its removal efficiency of antibiotic, antimicrobial activity, and antibiotic resistance selection potency from oxytetracycline (OTC) production wastewater. Doses of 0.4 and 1.2 mg O₃ per mg of initial OTC permitted 100% and 92% OTC removal from OTC solution (OTC, 10 mg/L) and OTC production waste mother liquor (OTC, 702 mg/L), respectively. With the removal of OTC, the OTC solution lost its antibacterial activity against *Streptococcus aureus*. The antibiotic resistance selection potency of OTC before and after ozonation was also evaluated. When activated sludge was exposed to OTC (10 mg/L) solution for 18 d, the OTC-resistant bacteria ratio increased from 2.0% to 28.2%, and the relative abundances of tetracycline resistance genes (*tet(A)*, *tet(X)*) and class 1 integron increased from 1.01% to 5.36% ($p < 0.05$). However, no significant change of OTC resistance was observed in activated sludge exposed to ozonated OTC solution, implying that the antibiotic resistance selection potency of OTC was alleviated by ozonation. This study demonstrated that ozonation can reduce antibiotic resistance selection potency from OTC production wastewater with a reasonable ozone dose.

Keywords: Ozonation; Oxytetracycline production wastewater; Antibacterial potency; Antibiotic resistance; Removal of antibiotic resistance selection potency

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